

What is claimed is:

1 1. A chemical process for the catalytic reduction of raw organic materials that include
2 higher molecular weight organic compositions, comprising the steps of:

3 a) introducing said organic material into a pressurized aqueous reactor
4 system having a pump that can generate a pressure of about 200-250
5 atmospheres;

6 b) heating said mixture in said reactor system in the presence of super-
7 critical water under high pressure and temperature;

8 c) maintaining said organic material at a temperature of about 400-525° C
9 for a sufficient period of time, such that said organic material is
10 chemically transformed into a mixture comprising lower molecular
11 weight liquid hydrocarbons of reduced viscosity, carbon dioxide
12 and, when protein or other nitrogenous compounds are present in
13 said organic material, amines; and

14 d) wherein said chemical transformation occurs in a single reactor zone of
15 said reactor system.

1 2. The process of claim 1, wherein said reactor system further comprises one or more
2 materials that are inert to said organic materials, their intermediate reaction
3 materials, and final products of said process.

1 3. The process of claim 1, wherein said reactor system further comprises cooling means
2 exiting an autoclave area.

1 4. The process of claim 1, wherein hydrolysis and decarboxylation occur at a temperature
2 of about 200-430° C.

1 5. The process of claim 4, wherein super-critical water with a dielectric constant of $\psi = 2$ -
2 5 is miscible with hydrocarbons.

1 6. The process of claim 1, wherein said reactor is maintained at a temperature of about
2 430-500° C.

1 7. The process of claim 1, wherein said catalytic reduction reactions occur simultaneously,
2 independently, in concert or in cascade fashion.

1 8. The process of claim 1, wherein said catalytic reduction reactions occur within about 3-
2 10 minutes.

1 9. The process of claim 1, further comprising the step of physical filtration of solids from
2 liquid phases.

1 10. The process of claim 1, further comprising the step of separating lower viscosity
2 constituents from each other by fractional distillation.

1 11. The process of claim 1, further comprising the step of separating combined inorganic
2 phase and metals-tars-organo-sulfur contaminants by centrifugation.

1 12. The process of claim 1, further comprising the step of adding glycerol as a desiccant
2 for drying generated hydrocarbons, and as an absorbent for amines, such that said
3 dried hydrocarbons can be separated before fractional distillation of liquid phase
4 products.

1 13. The process of claim 1, further comprising the steps of precipitating generated carbon
2 dioxide by lime water, and trapping amines as ammonium salts, thereby controlling
3 amine odors.

1 14. The process of claim 1, wherein said organic matter is selected from the group
2 consisting of:

3 a) plastics;

4 b) petroleum crude heavy oils;

5 c) kerogens;

6 d) tar sands;

7 e) shale;

8 f) bio-masses;

9 g) animal fats;

10 h) triglycerides;

11 i) lipids;

12 j) animal excrement;

13 k) vegetable wastes;

14 l) sludges;

15 m) organic wastes;

16 n) any similar organic matter, which is suitable for use in said catalytic
17 reduction process.

1 15. The process of claim 1, wherein said organic material is added in the form of an
2 aqueous mixture of about 10-50% by weight.

1 16. The process of claim 1, further comprising the step of recycling unconsumed organic
2 materials within said reactor system.

1 17. The process of claim 1, further comprising the step of pre-heating said organic
2 material to about 250° C or above, before said organic material is introduced into
3 said reactor system.

1 18. The process of claim 17, further comprising the step of recycling waste heat from said
2 process to pre-heat said organic material.

1 19. The process of claim 1, wherein animal or vegetable derived pathogens are destroyed
2 by sterilization at super-critical temperatures and pressures.

1 20. The process of claim 1, wherein inorganic and cellulose fractions of animal or
2 vegetable waste are transformed into nitrogen depleted carbonaceous compost,
3 thereby providing solid compost that can be applied to the land as soil builder or
4 burned as a fuel.

1 21. The process of claim 1, wherein the viscosity of said organic material is reduced by
2 conversion of 200-300° C-sensitive C_n esters, thioesters, amides, or amino acids to
3 C_{n-1} hydrocarbons and/or amines, respectively.

1 22. The process of claim 1, wherein the viscosity of said organic material is reduced by
2 thermolytic cracking of the more labile carbon-carbon and carbon-sulfur bonds at
3 400-500° C.

- 1 23. The process of claim 1, wherein, when present in said organic material, amides in
2 plastics or protein, esters in polyesters, triglycerides or lipids, and resins in tar
3 sands or petroleum heavy oil are hydrolyzed into acids, alcohols and amines.
- 1 24. The process of claim 23, wherein C_n carboxylic acids are decarboxylated to form
2 carbon dioxide and C_{n-1} hydrocarbons.
- 1 25. The process of claim 23, wherein amines, either added or generated, catalyze
2 hydrolysis of amides, esters, or thioesters.
- 1 26. The process of claim 23, wherein amines, either added or generated, inhibit the
2 corrosive effects of water at supercritical temperatures.
- 1 27. The process of claim 23, wherein a mixture of petroleum and triglycerides generates
2 glycerol that desiccates the hydrocarbon phase.
- 1 28. The process of claim 23, further comprising the steps of precipitating generated
2 carbon dioxide by lime water, and trapping amines as ammonium salts, thereby
3 controlling amine odors.
- 1 29. The process of claim 23, wherein super-critical water reductively hydrogenates the
2 cleaved carbon-carbon and carbon-sulfur terminal radicals without generating coke.
- 1 30. The process of claim 23, wherein carbon-carbon and carbon-sulfur scission occurs at a
2 temperature of 430-500° C.
- 1 31. The process of claim 30, wherein super-critical water with a dielectric constant of $\psi =$
2 2-5 is miscible with hydrocarbons.
- 1 32. The process of claim 1, wherein carbon-carbon and carbon-sulfur bonds in natural and
2 synthetic polymers, oligomers, and natural petroleum waxes, when present in said
3 organic material, are reductively cleaved to generate lower molecular weight
4 hydrocarbons and thiols.
- 1 33. The process of claim 32, wherein tramp metals precipitate out because lower
2 molecular weight hydrocarbons cannot solubilize them.
- 1 34. The process of claim 32, wherein iron oxide, sulfide ion and carbonate ion are
2 catalysts.
- 1 35. The process of claim 33, wherein sulfide catalyst is oxidized into sulfate ion.

1 36. The process of claim 1, wherein chemically solubilized wood extracted lignin is
2 chemically transformed into non-aqueous soluble liquid hydrocarbon and solid
3 carbonaceous fuel.

1 37. The process of claim 36, wherein Kraft sulfide ions are oxidized into sulfate ion.

1 38. The process of claim 36, wherein black liquor need not be concentrated in order to
2 separate chemically solubilized lignin from an aqueous phase.